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09/763,772	02/26/2001	Gustavo Deco	P00,1993	6347

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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
BELL, MELTIN	

ART UNIT	PAPER NUMBER
2121	10

DATE MAILED: 01/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/763,772	DECO ET AL.	
	Examiner	Art Unit	
	Meltin Bell	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,11 and 14-16* is/are rejected.

7)☒ Claim(s) *5 and 9-14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 June 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This action is responsive to application **09/763,772** filed 02/26/01.

Claims 1-16 have been examined.

Priority

Applicant is advised of possible benefits under 35 U.S.C. 119(a)-(d), wherein an application for patent filed in the United States may be entitled to the benefit of the filing date of a prior application filed in a foreign country.

Acknowledgment is made of applicant's claim for foreign priority based on application number 198 38 654.0 filed in Germany on **8/25/98** as national stage entry (371) of PCT/DE99/01949 with 7/1/99 as the international filing date.

Information Disclosure Statement

Applicant is respectfully reminded of the ongoing Duty to disclose 37 C.F.R. 1.56 all pertinent information and material pertaining to the patentability of applicant's claimed invention, by submitting in a timely manner PTO-1449, Information Disclosure Statement (IDS) with the filing of applicant's application or thereafter.

The information disclosure statement filed 2/26/01 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because of missing or inaccurate information in the listing:

- Other Prior Art references AL-AQ are missing the month and year of publication.

- Gerstner's reference AO was inadequately copied.

The information disclosure statement filed 6/11/01 **(paper 9 of this application)** fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the entire IDS **is missing**.

It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

Drawings

The United States Patent and Trademark Office of Draftsperson's Patent Drawings Review have reviewed the formal drawings.

The drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is required in correcting any errors of which applicant may become aware in the drawings.

The drawings are objected to because:

- Explanations on page 15, line 13 through page 16, line 8 for figure 2 items should be included in the figure itself.

- The 'WHKHS?' of FIG. 4's Item 402 is not adequately explained in the specification on page 22.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is required in correcting any errors of which applicant may become aware in the specification.

The disclosure is objected to because of the following informalities:

- German Patent Document DE 195 31 697 C2 on page 2, lines 7-8 should be included in the IDS if it is intended to be different from the other German Patent Document DE 195 31 967C2 on page 5, line 16 which is already included in the 2/26/01 IDS. Otherwise, the typo (697 vs. 967) should be corrected.
- Explanations on page 15, line 13 through page 16, line 8 for figure 2 items should be included in the figure itself.
- '231' (an item number in a figure) is missing after 'a third cable' on page 16, line 2.
- It is unclear whether training is occurring in step 103 of FIG. 1 and on page 21, lines 3-5.

- The summary of the invention section (page 6, line 4 through page 14, line 19) is too long. It is being used to present the independent and dependent claims verbatim. After presenting all of the claims once (page 6, line 4 through page 10, line 17) it begins to rephrase them again on page 10, line 18.
- 'INSERT DEPENDENT CLAIMS' on page 13, line 11 or other notes to the applicant, attorney or author preparing the specification should not be present within the specification.
- The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: Training a Neural Network of Pulsed Neurons Methods for EEG Signal Classification.

Appropriate correction is required.

Claim Objections

Claims 5 and 9-14 are objected to because of the following informalities:

Regarding claim 5:

The claim has a definition of I(T) that may conflict with the I(T) defined in claim 4 on which claim 5 depends.

Regarding claim 9:

The claim depends on itself: 'A method according to claim 9'.

Regarding claim 10:

The claim depends on claim 9 whose dependence is incorrect.

Regarding claim 11:

The preamble to the claim doesn't identify the useful process, method, machine, apparatus, manufacture, article of manufacture, composition of matter, or any new and useful improvement thereof for which a patent is sought.

Regarding claim 12:

The claim depends on claim 10 whose dependence is unclear.

Regarding claim 13:

The claim depends on claim 10 whose dependence is unclear.

Regarding claim 14:

The preamble to the claim doesn't identify the useful process, method, machine, apparatus, manufacture, article of manufacture, composition of matter, or any new and useful improvement thereof for which a patent is sought.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The invention as disclosed in claims 1, 8, 11 and 14 are directed to non-statutory subject matter. Claims 1, 8, 11 and 14 are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a credible asserted utility or a well established utility.

As methods claim steps of a process, claims 1, 8, 11 and 14 offer abstract ideas (e.g. "discrimination value") that are also not applied in the technological arts. Abstract ideas and their manipulation constitute "descriptive material" that is not patentable, *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759 and *Schrader*, 22 F.3d at 292-93, 30 USPQ2d at 1457-58, respectively. If the abstract ideas of claims 1, 8 and 11 represented functional descriptive material consisting of data structures and computer programs which impart functionality when employed as a computer component (recorded on some computer readable medium), they become structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. For examples,

- *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) offers claim to data structure stored on a computer readable medium that increases computer efficiency held statutory and
- *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 offers product-by-process claim to computer having a specific data structure stored in memory also held statutory while
- *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 offers claim to a data structure *per se* held nonstatutory.

Because the claims are not claimed to be practiced on a computer and/or stored on a computer readable medium, they are not limited to practical applications in the technological arts. Specifically, the claims are methods without any particular practical application, such as a program running on a computer and stored in a computer

readable medium or memory. On that basis alone, those claims are clearly nonstatutory.

Claims 1, 8, 11 and 14 are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a credible asserted utility or a well established utility. Claims 1, 8, 11 and 14 are also rejected under 35 U.S.C. 112, first paragraph. Specifically, since the claimed invention is not supported by either a credible asserted utility or a well established utility for the reasons set forth above, one skilled in the art clearly would not know how to use the claimed invention.

Claim Rejections - 35 USC § 112

To expedite a complete examination of the instant application, the claims rejected under 35 U.S.C. 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 8, 11 and 14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the

invention. Support for this 35 U.S.C. 112, first paragraph rejections comes from MPEP 2164.07(I)(A):

"As noted in *In re Fouche*, 439 F.2d 1237, 169 USPQ 429 (CCPA 1971), if "compositions are in fact useless, appellant's specification cannot have taught how to use them." 439 F.2d at 1243, 169 USPQ at 434. The examiner should make both rejections (i.e., a rejection under 35 U.S.C. 112, first paragraph and a rejection under 35 U.S.C. 101) where the subject matter of a claim has been shown to be nonuseful or inoperative.
The 35 U.S.C. 112, first paragraph, rejection should indicate that because the invention as claimed does not have utility, a person skilled in the art would not be able to use the invention as claimed, and as such, the claim is defective under 35 U.S.C. 112, first paragraph."

Claim Rejections - 35 USC § 103

To expedite a complete examination of the instant application, the claims rejected under 35 U.S.C. 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the Office presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Office to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1-8, 11 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gevins* U.S. Patent Number 5,119,816 (June 2, 1992) in view of

- *Arroyo et al* ACM Proceedings of the 20th Annual Southeast Regional Conference (April 1982) in further view of
- *Peng et al* The 1998 IEEE International Joint Conference on Neural Networks Proceedings (May 1998)

and further in view of *Deco et al* The American Physical Society Physical Review Letters (December 8, 1997).

Regarding claim 1:

Gevins teaches,

- a) training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a maximum first discrimination value is formed (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos")

- b) forming the discrimination value dependent on pulses that are formed by the pulsed neurons within the first time span as well as on a training sequence of input quantities that are supplied to the neural network (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session";

column 13, lines 44-47, "Pulse widths of...the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- c) implementing the following steps interactively: (column 5, lines 8-29, "For subsequent data...brain and head")

- shortening the first time span to form a second time span (column 13, lines 66-68, "The phase and...at the probe")

- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- otherwise, ending the method and the trained neural network is the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach new iterations with shorter time spans when first and second discrimination values are equal while

Deco et al teaches,

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Arroyo et al teaches,

- when the second discrimination value is the same as the first discrimination value, then performing a new iteration with a new second time span that is formed by shortening the second time span of the preceding iteration (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")
- improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to combine *Gevins* with *Deco et al* and *Arroyo et al* to obtain the invention specified in claim 1, a method for training a neural network that contains pulsed neurons. The modification would have been obvious because one of ordinary skill in the art would have been motivated to correctly and efficiently train a neural network for classifying EEG electrode locations.

Regarding claim 2:

Gevins teaches,

- a) training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a maximum first discrimination value is formed (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos")

- b) forming the discrimination value dependent on pulses that are formed by the pulsed neurons within the first time span as well as on a training sequence of input quantities that are supplied to the neural network (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- c) implementing the following steps interactively: (column 5, lines 8-29, "For subsequent data...brain and head")

- shortening the first time span to form a second time span (column 13, lines 66-68, "The phase and...at the probe")

- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- otherwise, ending the method and the trained neural network is the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach new iterations with shorter time spans when first and second discrimination values are equal or a first and second discrimination value optimization/maximization method that is not gradient based while

Deco teaches,

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Arroyo et al teaches,

- when the second discrimination value is the same as the first discrimination value, then performing a new iteration with a new second time span that is formed by shortening the second time span of the preceding iteration (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Peng et al teaches,

- an optimization method that is not gradient based is utilized for the maximization of at least one of the first discrimination value and of the second discrimination value (page 1147, Abstract, sentences 3-4, "The Alopex algorithm...error norm measure")

Motivation – The portions of the claimed method would have been highly desirable features in this art for

- good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")
- faster convergence (*Peng et al*, page 1148, section V, paragraph 2, "Simulation results show...speed and range")
- improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to combine *Gevins* with *Deco et al, Peng et al* and *Arroyo et al* to

obtain the invention specified in claim 2, a method for training a neural network that contains pulsed neurons. The modification would have been obvious because one of ordinary skill in the art would have been motivated to correctly and efficiently train a neural network for classifying EEG electrode locations.

Regarding claim 3:

The rejection of claim 2 is incorporated. Therefore, claim 3 is rejected under the same rationale as claim 2.

Regarding claim 4:

The rejection of claim 1 is incorporated. Claim 4's further limitations are taught in *Deco et al* - the first discrimination value I(T) satisfies the following rule:

$$I(T) = I\left(s; \{ t_1^{(1)},\ldots,t_m^{(1)},\ldots,t_{k1}^{(1)},t_1^{(2)},\ldots,t_m^{(2)},\ldots,t_{k2}^{(2)},\ldots, \ldots t_1^{(n)},\ldots,t_m^{(n)},\ldots,t_{kn}^{(n)},\ldots,t_1^{(N)},\ldots,t_m^{(N)},\ldots,t_{kN}^{(N)} \}\right),$$

wherein

- s references input quantities,
- $t_m^{(n)}$ references a pulse that is generated by a pulsed neuron n at a time m within a time span [0, T],
- k_n (n=1,...,N) references a point in time at which the pulsed neuron n has generated the last pulse within the time span [0,T], and
- N references a plurality of pulsed neurons contained in the neural network

(page 4697, paragraph 2, "We first consider... = $R \cdot |(\{t_0,\ldots,t_i,\ldots\};T)$. (2)").

Therefore, claim 4 is rejected under the same rationale as claim 1.

Regarding claim 5:

The rejection of claim 4 is incorporated. Claim 5's further limitations are taught in *Deco et al* - the first discrimination value I(T) satisfies the following rule:

$$I(T) = -\int p(out) \cdot \ln(p(out))dt_1^{(1)}\ldots dtk_1^{(1)}\ldots dt_{kN}^{(N)} +$$

$$+ \sum_{j=1}^{s} p_j \int p(out|s^{(j)}) \cdot \ln(p(out|s^{(j)}))dt_1^{(1)}\ldots dtk_1^{(1)}\ldots dt_{kN}^{(N)}$$

with

$$p(out) = \sum_{j=1}^{s} p_j p(out|s^{(j)}),$$

wherein

- $s^{(j)}$ references an input quantity that is applied to the neural network at a time j,
- p_j references a probability that the input quantity $s^{(j)}$ is applied to the neural network at a pint in time j,
- $p(out|s^{(j)})$ references a conditioned probability that a pulse is generated by a pulsed neuron in the neural network under the condition that the input quantity $s^{(j)}$ is applied to the neural network at a point in time j

(page 4697, paragraph 3, "In the second...in the interval [*t'*, *t'* + *T*]"; page 4698, paragraph 1, "where *t'* is...same rate *R*")

Therefore, claim 5 is rejected under the same rationale as claim 4.

Regarding claim 6:

The rejection of claim 1 is incorporated. Therefore, claim 6 is rejected under the same rationale as claim 1.

Regarding claim 7:

The rejection of claim 6 is incorporated. Therefore, claim 7 is rejected under the same rationale as claim 6.

Regarding claim 8:

Gevins teaches,

- a) training the neural network for a first time span such that a discrimination value is maximized, as a result whereof a maximum first discrimination value is formed (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos")

- b) forming the discrimination value dependent on pulses that are formed by the pulsed neurons within a first time span as well as on a training sequence of input quantities that are supplied to the neural network (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- c) implementing the following steps interactively: (column 5, lines 8-29, "For subsequent data...brain and head")

- shortening the first time span to form a second time span (column 13, lines 66-68, "The phase and...at the probe")

- forming a second discrimination value for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- otherwise, ending the method and the trained neural network is the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

- supplying the sequence of input quantities to the neural network (column 4, lines 5-9, "scaling the vector...the desired classification")

- forming a classification signal that indicates what kind of sequence of input quantities the supplied sequence is (column 2, lines 15-24, "the EEG spatial...signals for distortion"; column 3, lines 62-68, "electrode positions are...that particular canonical"; column 4, lines 1-15, "head. The patient's...of that head")

However, *Gevins* doesn't explicitly teach new iterations with shorter time spans when first and second discrimination values are equal while

Deco et al teaches,

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Arroyo et al teaches,

- when the second discrimination value is the same as the first discrimination value, then performing a new iteration with a new second time span that is formed by shortening the second time span of the preceding iteration (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")
- improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to combine *Gevins* with *Deco et al* and *Arroyo et al* to obtain the invention specified in claim 8, a method for classification of a sequence of input quantities upon employment of a neural network that contains pulsed neurons and was trained. The modification would have been obvious because one of ordinary skill in the art would have been motivated to correctly and efficiently train a neural network for classifying EEG electrode locations.

Regarding claim 11:

Gevins teaches,

- a) the neural network is trained such for a first time span that a discrimination value is maximized, as a result whereof a maximum first discrimination value is formed (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos")

- b) the discrimination value is formed dependent on pulses that are formed by the pulsed neurons within the first time span as well as on a training sequence of input quantities that are supplied to the neural network (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- c) the following steps are interactively implemented: (column 5, lines 8-29, "For subsequent data...brain and head")

- the first time span is shortened to form a second time span (column 13, lines 66-68, "The phase and...at the probe")

- a second discrimination value is formed for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- otherwise, the method is ended and the trained neural network is the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach new iterations with shorter time spans when first and second discrimination values are equal while

Deco et al teaches,

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Arroyo et al teaches,

- when the second discrimination value is the same as the first discrimination value, then a new iteration ensues with a new second time span that is formed by shortening the second time span of the preceding iteration (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")
- improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to combine *Gevins* with *Deco et al* and *Arroyo et al* to obtain the invention specified in claim 11, a neural network that contains pulsed neurons has been trained. The modification would have been obvious because one of ordinary skill in the art would have been motivated to correctly and efficiently train a neural network for classifying EEG electrode locations.

Regarding claim 14:

Gevins teaches,

- a processor that is configured such that the following steps implemented: (column 2, lines 6-10, "The head measurements...of head shapes")

- a) the neural network is trained such for a first time span that a discrimination value is maximized, as a result whereof a maximum first discrimination value is formed (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos")

- b) the discrimination value is formed dependent on pulses that are formed by the pulsed neurons within the first time span as well as on a training sequence of input quantities that are supplied to the neural network (column 3, lines 35-54, "the position of...or infirm patients"; column 4, lines 1-19, "The patient's head...EEG recording session"; column 13, lines 44-47, "Pulse widths of...the two echos"; column 14, lines 24-55, "More accurate values...or other means")

- c) the following steps are interactively implemented: (column 5, lines 8-29, "For subsequent data...brain and head")

- the first time span is shortened to form a second time span (column 13, lines 66-68, "The phase and...at the probe")

- a second discrimination value is formed for the second time span (column 13, lines 44-47, "Pulse widths of...the two echos")

- otherwise, the method is ended and the trained neural network is the neural network of the last iteration wherein the second discrimination value is the same as the first discrimination value (column 15, lines 3-17, "We have also...stop the loop")

However, *Gevins* doesn't explicitly teach new iterations with shorter time spans when first and second discrimination values are equal while

Deco et al teaches,

- decision time as related to discriminability (page 4699, paragraph 2, "Let us analyze...is most efficient")

Arroyo et al teaches,

- when the second discrimination value is the same as the first discrimination value, then a new iteration ensues with a new second time span that is formed by shortening the second time span of the preceding iteration (page 128, Software Overview section, paragraphs 4-6, "The feature extraction...xenon photo stimulator"; The Implementation section, paragraph 1, "The software system...this data base")

Motivation – The portions of the claimed method would have been a highly desirable feature in this art for

- good classification error rates (*Arroyo et al,* page 126, Abstract, sentence 8, "The system has...classification error rates")
- efficient discrimination (*Deco et al*, page 4700, paragraph 2, "In conclusion, the...transmission of information")

- improving electroencephalograph (EEG) spatial resolution (*Gevins*, column 1, lines 57-68, "The three-dimensional positions...of a subject"; column 2, lines 1-24, "is measured. A...signals for distortion")

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to combine *Gevins* with *Deco et al* and *Arroyo et al* to obtain the invention specified in claim 14, an arrangement for training a neural network that contains pulsed neurons. The modification would have been obvious because one of ordinary skill in the art would have been motivated to correctly and efficiently train a neural network for classifying EEG electrode locations.

Regarding claim 15:

The rejection of claim 14 is incorporated. Therefore, claim 15 is rejected under the same rationale as claim 14.

Regarding claim 16:

The rejection of claim 14 is incorporated. Therefore, claim 16 is rejected under the same rationale as claim 14.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- *Gevins;* U.S. Patent Number 5,119,816

- *Gevins et al;* U.S. Patent Number 5,331,970

- *Spitzer et al* U.S. Patent Number 5,192,343

- *Deco* U.S. Patent Application Number 2003/0228054

- *Tresp et al* U.S. Patent Number 5,751,571

- *Schurmann et al* U.S. Patent Number 6,117,074

- *Deco et al* U.S. Patent Number 6,266,624

- *Saucedo et al* U.S. Patent Number 5,754,738

  - alopex stochastic optimization algorithm

- *Tresp et al* U.S. Patent Number 5,806,053

  - equivalent of German patent document DE 195 31 967 C2

- *Guyon et al* U.S. Patent Number 5,105,468

  - time delay neural network patent possibly related to German patent document DE 195 31 697 C2

- *Arroyo et al*; "A Modular Software Real-Time Brain Wave Detection System"; ACM Proceedings of the 20th Annual Southeast Regional Conference; April 1982; pp 126-131

- *Deco et al;* "Information Transmission and Temporal Code in Central Spiking Neurons"; The American Physical Society Physical Review Letters; Vol. 79, Iss. 23; December 8, 1997; pp 4697-4700

- *Peng et al;* "Generalization and Comparison of Alopex Learning Algorithm and Random Optimization Method for Neural Networks"; The 1998 IEEE International Joint Conference on Neural Networks Proceedings; IEEE World Congress on Computational Intelligence; Vol. 2; 4 May 1998; pp 1147-1149

- *Melissaratos et al*; "A Parallel Implementation of the Alopex Process"; Proceedings of the 1989 Fifteenth Annual Northeast Bioengineering Conference; 27-28 March 1989; pp 179-180

- *Cooley et al*; "Combining Structural and Spectral Information for Discrimination Using Pulse Coupled Neural Networks in Multispectral and Hyperspectral Data"; 1997 IEEE International Geoscience and Remote Sensing Symposium Proceedings; IGARSS'97; Vol. 4; 3-8 August 1997; pp 1666-1668

- *Surkan et al*; "Prediction by Neural Network Methods Compared for Energy Control Problems"; Proceedings of the American Power Conference; 1996; pp 231-236

- observation used to shorten time spans for discriminations

Any inquiry concerning this communication or earlier communications from the Office should be directed to Meltin Bell whose telephone number is 703-305-0362. This Examiner can normally be reached on Mon - Fri 7:30 am - 4:30 pm.

If attempts to reach this Examiner by telephone are unsuccessful, his supervisor, Anil Khatri, can be reached on 703-305-0282. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

MB/ 9/4/01

ANIL KHATRI
SUPERVISORY PATENT EXAMINER